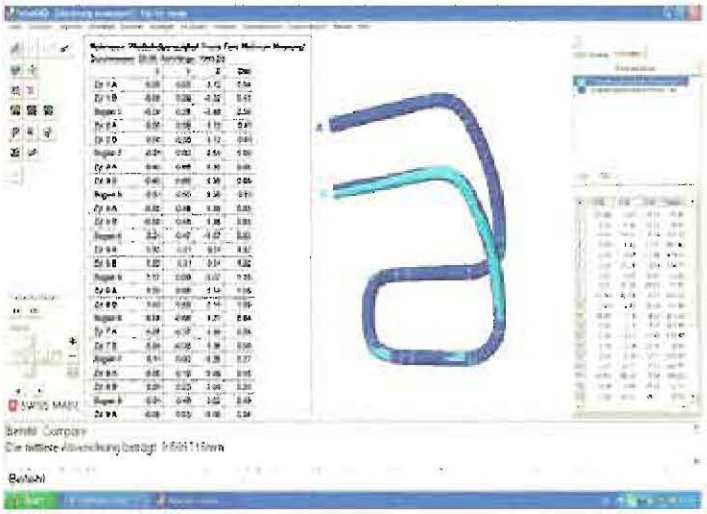
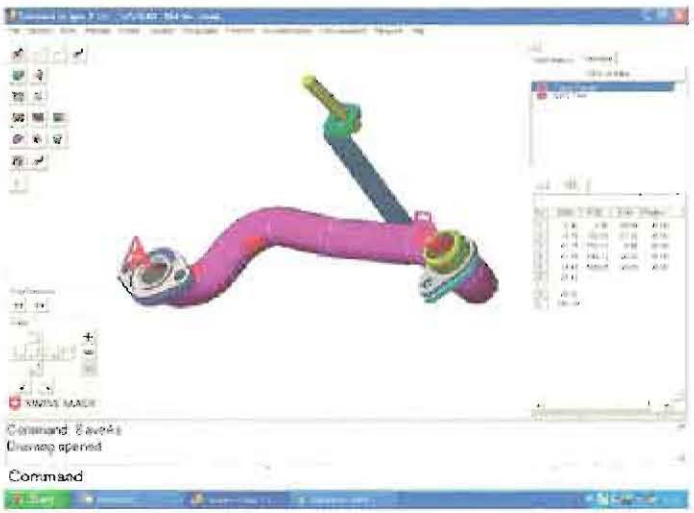
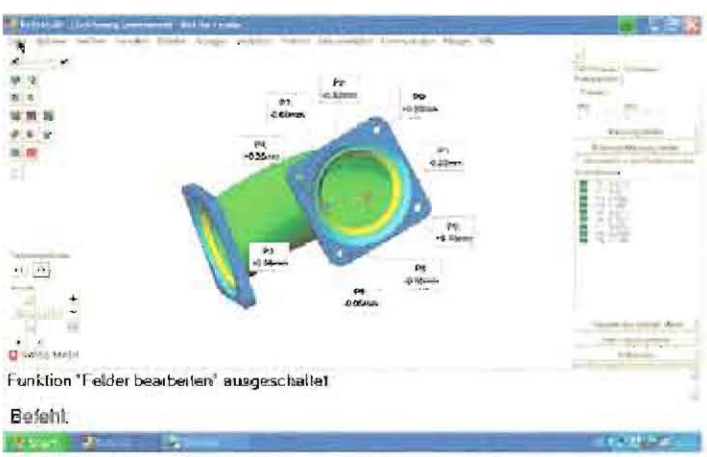
A little tube philosophy.....





Everyone, who works specifically with tubing measurements, will know that it is not always possible to obtain the same results in repeat measurements. CMM's achieve higher accuracy as the procedure always automatically measures the same point, having been programmed like a robot. However, this measurement process is time consuming and extremely complex for tube measurements. Optical measurements using fixed cameras to measure a fixed tube can be very accurate only when the tube has no re-entrant angles or add-on's to contend with. Both the above mentioned measurement operations acquire deviation results within hundredths of a millimeter. Co-ordinate measuring arms are more flexible, but the manual measuring procedure to guide the probe to a point causes different deviation values, as the probe cannot find the exact same point for repeatability and reproducibility. Therefore the average deviation is within tenths of a millimetre - the deviation of 0.3mm is a good result for tube measurement. All values which are demanded by the quality department, which take the values in the scale of hundredths as a basis from measurements of geometric parts. For tubes this accuracy is not needed, only for their audit or ISO certification.

To understand the complexities of tubing, one should know some tube-facts. A tube is a "living part". It changes all the time, in its shape, as well as after a production treatment. The key sentence in tube treatment is - when a tube straight is not straight and the outline is not round, specifically in the bends?



'Springback – pure magic'

After the production of a tube, it will be stored, transported, set out at different temperatures, treated by cutting or end conditioning, and last but not least, bent in a tube bender. The magic word for tube bending people is "springback".

This means that the momentum impact to the tube material after a pressed, or a pulstrusion bend, results in a change of the bend angle. If a bend is set up to 90° the material differs, for example from 88° to 92° dependant on its 'springback' and the settings of the bender. To achieve an accurate bend degree, it is advisable to use special software to correct the deviation. Of course, an experienced operator can evaluate the deviation, and correct it according to his experience, but this procedure is time consuming and uses more material. Usually it needs several attempts until the product is correct.

TezetCAD, the 'state of the art' software from Swiss company Tezet Technik, has been available for the last 20 years. TezetCAD ensures that the second tube is bent correctly, because the software generates the bender corrections automatically.

This tube specialised software is modularly structured and has more than 100 variable tube functions. Primarily, it is user friendly because it is menu guided, and TeZetCAD is constantly in touch with evolving industrial demands for new features and new production requirements. For years TeZet have launched innovations which have been way ahead of the game, and have, in a short space in time, become recognized industry standards. Just two examples: firstly, in 2007 the algorithm for freeform bent tube handling was programmed by TeZet and integrated into TeZetCAD, with TeZet still the only provider for this section on the world market. Secondly the 'Iges' self-programmed converter generates tube data from industrial tube designs of half-shells instead of using a centerline or xyz coordinates.

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